

CLAIMS

The following is claimed:

- 1 1. An adaptive communications system comprising:
2 a unitary matrix filter; and
3 a processor configured with logic to adapt the unitary matrix filter to diagonalize a
4 transmission channel.
- 1 2. The system of claim 1, wherein the processor is further configured with logic to
2 adapt the unitary matrix filter at a receiver, and then use the unitary matrix filter for
3 transmission when the receiver becomes a transmitter.
- 1 3. The system of claim 2, wherein the processor is further configured with logic to
2 use the unitary matrix filter for transmission without feedback from the receiver to the
3 transmitter.
- 1 4. The system of claim 1, wherein the processor is further configured with logic to
2 represent a transmission channel as a channel matrix, wherein the processor is further
3 configured to diagonalize the channel matrix by singular value decomposition.
- 1 5. The system of claim 1, wherein the unitary matrix filter filters symbol vectors
2 corresponding to a communication signal.

- 1 6. The system of claim 5, wherein the symbol vectors include discrete modulated
2 signals.
- 1 7. The system of claim 6, wherein the discrete modulated signals are transmitted and
2 received in an array-to-array communications system.
- 1 8. The system of claim 6, wherein the discrete modulated signals are transmitted and
2 received in an array-to-array time division duplex communications system.
- 1 9. The system of claim 1, wherein the processor and the logic and the unitary matrix
2 filter are embodied in a receiver.
- 1 10. The system of claim 1, wherein the processor and the logic and the unitary matrix
2 filter are embodied in a transmitter.
- 1 11. The system of claim 1, wherein the processor and the logic and the unitary matrix
2 filter are embodied in a transceiver.
- 1 12. The system of claim 1, wherein the processor and the logic and the unitary matrix
2 filter are embodied in a cellular phone.
- 1 13. The system of claim 1, wherein the processor and the logic and the unitary matrix
2 filter are embodied in a base station.

1 14. The system of claim 1, wherein the processor and the logic and the unitary matrix
2 filter are embodied in a modem.

1 15. The system of claim 1, wherein the unitary matrix filter is defined by a singular
2 value decomposition of a channel matrix.

1 16. The system of claim 1, wherein the processor is further configured with the logic
2 to adapt the unitary matrix filter without requiring a training sequence.

1 17. The system of claim 1, wherein the processor is further configured with the logic
2 to adapt the unitary matrix filter without requiring feedback to a transmitter from a
3 receiver.

1 18. The system of claim 1, wherein the processor is further configured with the logic
2 to adapt an estimate of a unitary factor of a singular value decomposition of a channel
3 matrix.

1 19. An adaptive communications method comprising the steps of:
2 receiving a signal; and
3 adapting a unitary matrix for filtering the received signal.

- 1 20. The method of claim 19, further comprising the step of filtering a transmitted
2 signal with the unitary matrix.
- 1 21. The method of claim 20, wherein the step of filtering is performed without
2 feedback about the received signal.
- 1 22. The method of claim 19, further comprising the steps of representing a
2 transmission channel as a channel matrix and diagonalizing the channel matrix by
3 singular value decomposition.
- 1 23. The method of claim 19, further comprising the step of representing the signal as
2 symbol vectors corresponding to a communication signal.
- 1 24. The method of claim 23, wherein the symbol vectors include discrete modulated
2 signals.
- 1 25. The method of claim 24, wherein the discrete modulated signals are transmitted
2 and received in an array-to-array communications system.
- 1 26. The method of claim 25, wherein the discrete modulated signals are transmitted
2 and received in an array-to-array time division duplex communications system.

- 1 27. The method of claim 19, further comprising the step of implementing singular
2 value decomposition processing without feedback from a receiver to a transmitter.
- 1 28. The method of claim 19, further comprising the step of defining the unitary matrix
2 by a singular value decomposition of a channel matrix.
- 1 29. The method of claim 19, wherein the step of adapting further includes the step of
2 adapting the unitary matrix without requiring a training sequence.
- 1 30. The method of claim 19, wherein the step of adapting further includes the step of
2 adapting the unitary matrix without requiring feedback to a transmitter from a receiver.
- 1 31. The method of claim 19, wherein the step of adapting further includes the step of
2 adapting an estimate of a unitary factor of a singular value decomposition of a channel
3 matrix.